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A Randomized Controlled Trial of the Effectiveness of Brief-CBT for Patients with Symptoms of Posttraumatic Stress Following a Motor Vehicle Crash

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Background: Motor vehicle crashes (MVCs) are leading contributors to the global burden of disease. Patients attending accident and emergency (A&E) after an MVC may develop symptoms of posttraumatic stress disorder (PTSD). There is evidence that brief cognitive behavioural therapy (B-CBT) can be effective in treating PTSD; however, there are few studies of the use of B-CBT to treat PTSD in MVC survivors. **Aims:** This study examined the effects of B-CBT and a self-help program on the severity of psychological symptoms in MVC survivors at risk of developing PTSD. **Method:** Sixty participants who attended A&E after a MVC were screened for PTSD symptoms and randomized to a 4-weekly session B-CBT or a 4-week self-help program (SHP) booklet treatment conditions. Psychological assessments were completed at baseline (1-month post-MVC) and posttreatment (3- and 6-month follow-ups) by utilizing Impact of Event Scale-Revised (IES-R) and Hospital Anxiety and Depression Scale (HADS). **Results:** There were significant improvements in the measures of anxiety, depression, and PTSD symptoms over time. Participants treated with B-CBT showed greater reductions in anxiety at 3-month and 6-month follow-ups, and in depression at 6-month follow-up. A comparison of effect size favoured B-CBT for the reduction of anxiety and depression symptoms measured by HADS. A high level of pretreatment anxiety and depression were predictive of negative outcome at 6-month follow-up in the SHP condition. There was no differential effect on PTSD symptoms measured by IES-R. **Conclusions:** This trial supports the efficacy of providing B-CBT as a preventive strategy to improve psychological symptoms after an MVC.

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Introduction

According to the World Health Organization (WHO), motor vehicle crashes (MVCs) comprise the ninth greatest contributor to the global burden of disease (WHO, 2004). The WHO has warned that based on current trends, road traffic injury will become the third greatest contributor to the global burden of disease by 2020. Previous studies have shown that survivors of MVCs, and in particular those required to attend accident and emergency (A&E) departments afterwards, may develop symptoms of posttraumatic stress disorder (PTSD) (Blanchard and Veazey 2001; Wu and Cheung, 2006). However, the effects of different early psychological interventions for people with PTSD symptoms in the aftermath of an MVC are not clear. Randomized controlled trials (RCTs) have found that a single-session critical incident stress debriefing has no effect in reducing the probability of developing chronic PTSD after a traumatic event (Adler et al., 2008; Rose, Bisson, Churchill and Wessely, 2002). Providing a self-help educational booklet to A&E attendees to prevent the development of PTSD may be ineffective, with one study finding that among patients who met the criteria for PTSD at baseline, those in the control group improved more than those in the intervention group (Turpin, Downs and Mason, 2005). In another RCT, although subjective ratings of the usefulness of a self-help booklet was high, the trial did not support the efficacy of self-help information as a preventive strategy for reducing the incidence of anxiety, depression, and PTSD among A&E attendees (Scholes, Turpin and Mason, 2007). An RCT investigating the effectiveness of writing exposure as a self-help intervention for traumatic injury patients at risk of developing PTSD also failed to support the use of this treatment as an early self-help intervention technique (Bugg, Turpin, Mason and Scholes, 2009). The efficacy of non-therapist directed or non-guided self-help programs involving exercises normally included in cognitive behavioural therapy (CBT) is thus unclear.

CBT was found to be superior to supportive counseling, a self-help program (SHP), and repeated assessments both in preventing the development of chronic PTSD in people with acute stress disorder (Bryant et al., 2006, 2008) and as an early intervention for PTSD (Ehlers et al., 2003). However, the resources used in previously studied CBT programs were usually more extensive than those used in the comparison early intervention. For example, in one RCT, a program of 12 weekly sessions of CBT within a 3-month period and up to 3-monthly booster sessions was compared with a self-help booklet and repeated assessments (Ehlers et al., 2003). In a brief CBT (B-CBT) study, 5 weekly sessions of exposure-based therapy led to a greater reduction in subsequent PTSD symptoms in patients with acute stress disorder compared with cognitive restructuring or a wait-list control group (Bryant et al., 2008). However, RCTs have found that although 4-session B-CBT was superior to no intervention and supportive counseling, it was no more effective than repeated assessments by a clinician in reducing PTSD symptoms for sexual assault survivors who met the diagnostic criteria of PTSD (Foa, Zoellner and Feeny, 2006) and repeated assessments by a clinician were just as effective in reducing PTSD symptoms for survivors of physical injury with PTSD symptoms who did not necessarily meet the criteria of PTSD (Bisson, Shepherd, Joy, Probert and Newcombe, 2004). These findings suggest that a trauma-focused intervention aimed at patients with severe PTSD symptoms can accelerate recovery. However, it has not yet been consistently demonstrated

that B-CBT is superior to other kinds of brief interventions for hastening recovery from relatively mild posttraumatic stress or in the prevention of chronic PTSD. In addition, very few studies have investigated the treatment effects of B-CBT among MVC survivors at risk of developing PTSD, anxiety, and depression. A Cochrane review of 15 studies that tested a diverse range of early psychological interventions to treat acute traumatic stress symptoms suggested that individual trauma-focused CBT is effective for individuals with acute traumatic stress symptoms compared with both a waiting list and supportive counseling interventions. However, several potential biases were identified in these studies, including small sample sizes and unexplained statistical heterogeneity in some of the comparisons. The Cochrane review proposed that the longer term effect of trauma-focused CBT, the potential benefits of other forms of intervention, and the most effective psychological intervention in the initial stages after a traumatic event still need to be evaluated (Roberts, Kitchiner, Kenardy and Bisson, 2010). Moreover, the overwhelming evidence for the treatment of PTSD has come from the West, and the findings may not be generalizable to other cultures.

This study aimed at extending earlier work by Bisson et al. (2004) in Hong Kong, where the majority of the population is Chinese. We compared the effects of B-CBT involving four weekly sessions and a self-help program booklet (SHP) on hastening recovery from posttraumatic stress in patients who attended A&E after an MVC. We hypothesized that participants who received B-CBT would have significantly lower scores on the Hospital Anxiety and Depression Scale (HADS) and Impact of Event Scale-Revised (IES-R) compared to the SHP control group at 3 and 6 months posttreatment. To enhance understanding of the factors that may affect treatment response, predictors including pretreatment symptom severity and treatment adherence associated with positive and negative outcomes were examined.

Method

Participants were recruited through the A&E department of the Caritas Medical Centre, Hong Kong, following ethics committee approval. The sample size was determined by the availability of participants within the study period, which was 3 years. The target of a sample size of 30 for each group was planned to achieve the power of .78 for a small-to-medium effect size of .50 (Friendly, 2004). All consecutive A&E admissions meeting the entry criteria were contacted by telephone within one week of their MVC by a research assistant. Interested individuals were sent an information sheet that described the study, a consent form, and a survey on their personal demographic information, level of functioning, and perception of the impact of the trauma. Self-report measures on psychological distress were also included for the early engagement of participants in the study. The participants were requested to complete and send the forms back to the research assistant within a week in the return envelope provided. The same set of measures on psychological distress was sent again 1 month after the MVC for inclusion screening and to establish the baseline symptom level. The survey and self-reported measures were sent and returned by post. A prospective investigation drawn from an independent population of MVC survivors who attended the same A&E showed that people who met the trial criteria at 1 month after the accident had a 62% chance of still having PTSD symptoms at 6 months after the accident (Wu and Cheung, 2006).

Study entry criteria

The study entry criteria were: attended A&E after an MVC; had a local home address; aged 18 or above; able to fill in the questionnaire by themselves; no existing major psychiatric disorders; no evidence of cognitive deficit; and evidence of persisting psychological distress on the Impact of Event Scale-Revised (IES-R) (Weiss and Marmar, 1997; Wu, 2011), with a score of greater or equal to 2 (i.e. a moderate level of distress) in one or more of the three IES-R subscales (i.e. Intrusion, Avoidance, and Hyperarousal) at 1-month follow-up after the MVC.

Design

This was an RCT in which a 4-session B-CBT program was compared with a self-help booklet consisting of a structured 4-week SHP. Both conditions were conducted in individual format. Participants who satisfied the study entry criteria at 1 month after an MVC were randomly assigned either to the B-CBT or the SHP treatment conditions by a clerical staff member who was blinded to the condition of the participants. For each participant, the clerk drew lots from an opaque box with two cards representing the two interventions.

Measures

The primary outcome measure was the change in scores in the Chinese versions of the IES-R (Wu, 2011) and Hospital Anxiety and Depression Scale (HADS) (Leung, Ho, Kan, Hung and Chen, 1993) from baseline (i.e. 1 month after the MVC) to 3 and 6 months after the MVC. The IES-R consists of three subscales representing three PTSD symptom clusters: Intrusion, Avoidance, and Hyperarousal. The HADS consists of two subscales: Anxiety (HADS-A) and Depression (HADS-D). The Chinese versions of both scales have sound psychometric properties. The Chinese IES-R has good diagnostic utility in identifying PTSD based on the Clinician-administered PTSD Diagnostic Scale (CAPS) and is sensitive to changes in PTSD symptoms (Wu, 2011; Wu and Cheung, 2006). The HADS is sensitive to changes in anxiety and depressive symptoms related to the aftermath of trauma, including MVCs (e.g. Mayou, Black and Bryant, 2000). The Chinese version of the HADS has good internal consistency and a favourable scale equivalence that is similar to that of the original English version (Leung et al., 1993; Wu, 2011).

Intervention

The participants received and completed the assigned intervention within a period of 1–3 months after the MVC. The B-CBT intervention consisted of four 1.5-hour weekly sessions. The content of the 4-session B-CBT was adapted from a previous manual used to examine the effect of B-CBT on PTSD symptoms after physical injury (Bisson et al., 2004), and so was suitable for the context of an MVC. The sessions were administered by qualified clinical psychologists and supervised by K.K.W. Intervention fidelity was ensured in three ways. First, the B-CBT intervention was defined in detail in an intervention manual. Second, K.K.W. offered training based on the manual. Finally, K.K.W. reviewed the taped intervention sessions to ensure adherence.

During the B-CBT intervention, the participants were educated about stress responses after an MVC and the rationale of exposure-based CBT for habituation to and the realistic appraisal of PTSD features caused by the MVC. They were then encouraged to describe

the MVC in detail, including their thoughts and feelings; the sights, smells, and noises; and their emotions and physical reactions. The account was written and read aloud by the participants and recorded on an MP3. The participants were then asked to read aloud the written account or listen to the audio account for at least half an hour every day throughout the intervention as a homework assignment. Cognitive distortions, such as unrealistic beliefs about present travel safety, were identified and discussed. Image habituation training, where a traumatic image is kept repeatedly in the mind for 30 seconds or more, was used if the participant was being troubled by specific distressing intrusive images. A graded in vivo exposure program was devised for participants who were avoiding real-life situations. The homework task comprised reading the written account and any agreed exposure goals. During the final session, the discussion focused on achievements and difficulties over the course of the therapy. The participants were given a written summary that outlined their achievements, areas for attention, and any remaining difficulties identified. Levels of functioning, progress, and homework compliance were reviewed at the follow-up sessions.

Participants randomly assigned to the SHP intervention were provided with an A5-size 64-page self-help booklet compiled by F.W.L. The booklet consisted of a 4-week self-help program based on the B-CBT manual used in the study and a published PTSD self-help workbook (Williams and Poijula, 2002). The content was adapted for MVCs and written in Chinese. It included education on PTSD responses and the rationale for exposure-based exercises for habituation and the realistic appraisal of PTSD features caused by a MVC. Readers were encouraged to practise the exposure exercises, cognitive processing, and relaxation techniques by following the instructions in the SHP. For example, they were encouraged to write a detailed account of the MVC. After writing the account, they were then asked to read the written account for at least half an hour every day throughout the intervention period. The trial protocol is available from the authors.

A research assistant contacted the participants by phone on a weekly basis for 4 weeks to encourage them to follow the instructions of the SHP and clarify any queries regarding the research. However, the research assistant did not offer any clinical guidance, such as how to devise the exposure exercise. Intervention fidelity was monitored in two ways: first, the SHP was defined in detail in the booklet; second, the participants were contacted over the phone on a weekly basis and asked to fill in an SHP compliance form to indicate whether they had read and followed the exercises suggested in the booklet. Among the 28 participants, 82% indicated that they had read the booklet. Of these 28 participants, 46% fully completed the exercises and 21% partially completed at least 50% of the exercises.

Before the randomization, the participants were advised that no alternative intervention other than the assigned B-CBT or SHP would be provided during the period studied because this could confound the results, but that they could contact the investigators at any time should they need professional support. Participants who received other formal clinical psychological or psychiatric services during the period studied were excluded from the final analysis. An overview of the participant flow, the number of treatment sessions completed and follow-up is presented in Figure 1.

Statistical analysis

As in the study conducted by Bisson and colleagues (2004) and other comparable studies (e.g. Scholes et al., 2007; Foa et al., 2006), the main analyses test whether the treatment conditions led to differential outcomes by comparing the mean values obtained from the main outcome

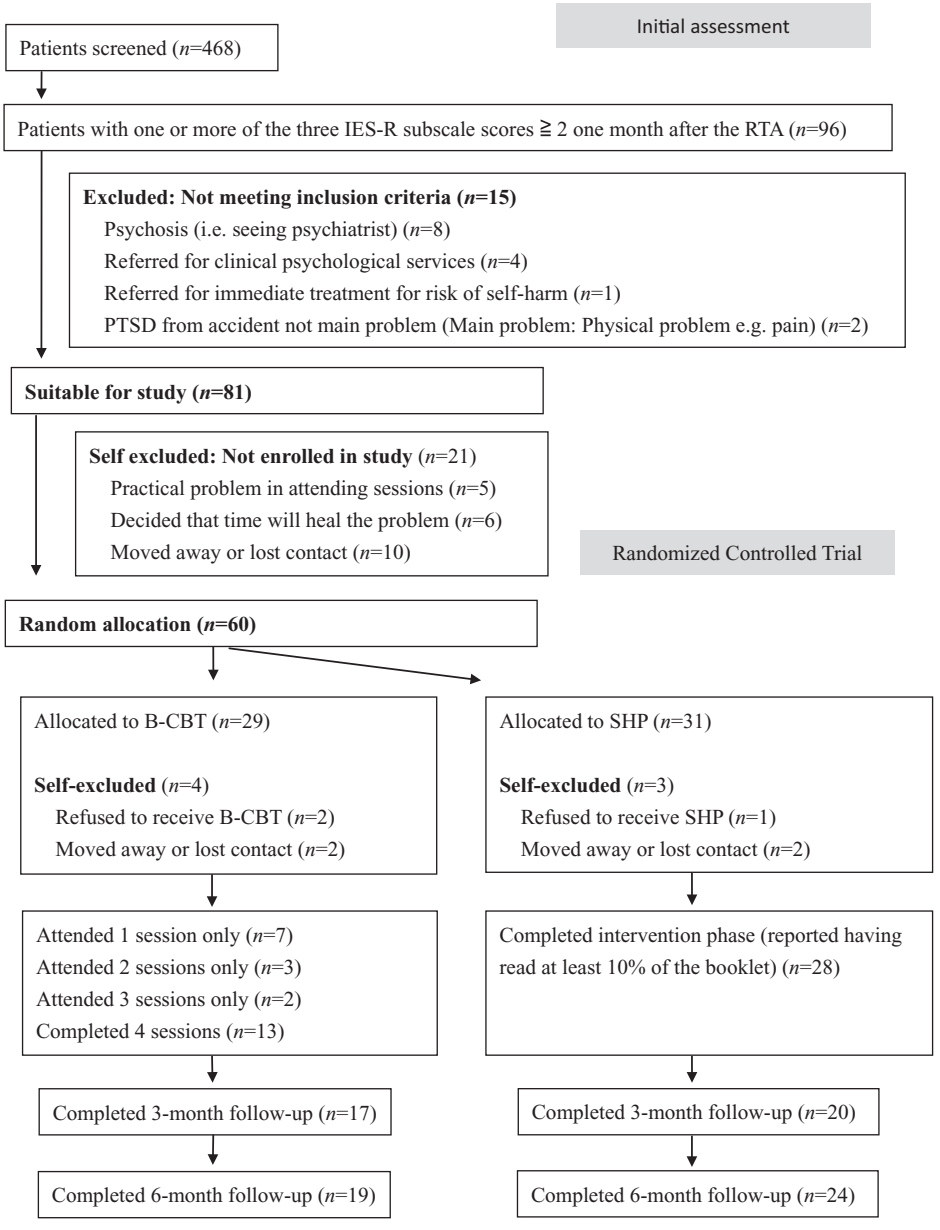

Figure 1. Overview of participant progress. IES-R = Impact of Event Scale-Revised. B-CBT = Brief Cognitive Behavioral Therapy. SHP = Self-Help Program

measures at 3- and 6-month follow-up for the two intervention conditions using analysis of covariance (ANCOVA), with the baseline scores (1 month after the MVC) as covariates and a 95% confidence interval. The ANCOVA was performed separately for each variable and time point. As a reference, repeated measures ANOVAs in a mixed design analysis were also

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conducted, with any significant interactions being qualified for the measures where baseline differences existed. Both intention-to-treat (ITT) and completer analyses were conducted. The ITT analysis included all of the participants who consented and completed the baseline assessment. Posttreatment scores at 3-month follow-up were substituted for the baseline values, and posttreatment scores at 6 months were then substituted for the scores at 3-month follow-up or the baseline values if the scores at 3-month follow-up were missing. There were no differences between the findings of the ITT and the completer analysis, and we thus report the completer analysis.

The treatment effect sizes were calculated from the Cohen's *d* effect sizes, which were derived by calculating the mean difference between assessments of each treatment condition and dividing this by the pooled standard deviation (Cohen, 1988). Following the International Society for Traumatic Stress Studies treatment guidelines for PTSD (Foa, Keane, Friedman and Cohen, 2009), the Hedges's unbiased *g* effect sizes were used to correct for variation due to the small sample size (Hedges, 1982). For ease of comparability, the signs of the effect sizes were adjusted such that positive effect sizes always represented a better outcome than the comparison group. The repeated measures analyses were then performed separately for each treatment condition by comparing the change in symptoms at 3-month and 6-month posttreatment follow-up, respectively, with the 1-month symptom measures as the baseline. Effect Size Generator-Pro (Devilly, 2004) was used to test the statistical difference between the two effect sizes for changes in symptoms within each treatment condition at the two posttreatment time points. The dichotomous criteria of treatment response at 6-month follow-up for the two treatment conditions were compared with χ^2 tests. Treatment gain was defined by a reduction in the subscale scores of the HADS or IES-R from equal or above to below the cut-off point for moderate level of distress between 1 month and 6 months. Phi was used as the measure of effect size for the χ^2 tests.

Forward linear stepwise regression analyses were performed separately for each treatment condition to examine the role of the independent variables in predicting the treatment response. As the sample size was limited, the last valid posttreatment score of the participants who did not complete the trial was carried forward in the analysis. To minimize the number of regression analyses for the limited sample in each condition, the total IES-R and HADS scores were used. The analysis aimed to find out whether the total IES-R and HADS scores were reduced at 6-month follow-up when the 1-month pretreatment score was used as the baseline. The predicting variables were selected a priori to reflect pretreatment symptom severity, which included the IES-R and HADS total scores at 1 month after MVC and treatment adherence; this was represented by the number of sessions attended by the B-CBT group and whether the participants had read the self-help program in the SHP group. The variables were entered simultaneously and the forward conditional method was adopted. A variable was entered if the significance level of its *F*-to-centre was less than the entry value of 0.05, and removed if the significance was greater than the removal value of 0.1.

Results

Baseline analysis

Participants' characteristics in each treatment condition are presented in Table 1. Chi-square tests and one-way analyses of variance (ANOVAs) of the participants' demographic characteristics and pretreatment psychopathological measures were performed to examine the

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Table 1. Comparison of participants' characteristics and pretreatment psychological measures between Brief Cognitive Behavioral Therapy (B-CBT) and Self-Help Program (SHP) groups

	B-CBT ($n = 25$)	SHP ($n = 28$)	F
Pre-MVC demographic and background variables			
Age, *M* (*SD*)	35.72 (11.32)	43.07 (14.07)	(1,51) = 4.33*
Female gender, *n* (%)	7 (28.0%)	10 (35.7 %)	
Past psychiatric history, *n* (%)	2 (8.0%)	0 (0%)	
MVC related variables			
Others injured in the MVC, *n* (%)	9 (36.0%)	9 (33.1%)	
Injury severity [a], *M* (*SD*)	1.28 (0.68)	1.32 (0.67)	
Required surgery, *n* (%)	1 (4.0%)	1 (3.5%)	
Duration of sick leave [b], *M* (*SD*)	13.71 (9.69)	10.20 (7.23)	
Post-MVC variables			
Perceived threat of life [c], *M* (*SD*)	3.50 (0.98)	3.30 (1.07)	
Planned for legal litigation, *n* (%)	19 (76.0%)	15 (53.5%)	
Psychological measures at 1-week after MVC			
HADS-Anxiety, *M* (*SD*)	12.67 (3.56)	11.96 (3.94)	
HADS-Depression, *M* (*SD*)	10.50 (3.22)	10.12 (4.68)	
IES-R (Intrusion), *M* (*SD*)	2.26 (0.80)	2.08 (0.75)	
IES-R (Avoidance), *M* (*SD*)	1.46 (0.66)	1.48 (0.66)	
IES-R (Hyperarousal), *M* (*SD*)	2.44 (0.75)	1.85 (0.70)	(1,48) = 8.33**
Psychological measures at 1-month after MVC			
HADS-Anxiety, *M* (*SD*)	13.92 (3.57)	11.29 (3.30)	(1,51) = 7.80**
HADS-Depression, *M* (*SD*)	11.84 (3.05)	9.43 (3.63)	(1,51) = 6.77*
IES-R (Intrusion), *M* (*SD*)	2.37 (0.79)	2.09 (0.46)	
IES-R (Avoidance), *M* (*SD*)	1.70 (0.72)	1.73 (0.42)	
IES-R (Hyperarousal), *M* (*SD*)	2.66 (0.62)	2.08 (0.55)	(1,51) = 12.89**

Notes: HADS = Hospital Anxiety and Depression Scale; IES-R = Impact of Event Scale – Revised. [a] Injury severity was ranked into four categories by doctors in the emergency department with 1 representing the injury was mild, 2 representing the injury was moderate, 3 representing the injury was severe, and 4 representing the injury was life-threatening. [b] Duration of sick leave since the MVC was self-reported and ranked into nine categories with 1 representing zero day, 2 representing 1–2 days, 3 representing 3–5 days, 4 representing 6–9 days, 5 representing 10–15 days, 6 representing 16–30 days, 7 representing 31–60 days, 8 representing 60 days or above, and 9 representing uncertain, still on sick leave. [c] Level of perceived threat to life caused by the MVC was self-reported and defined by a 5-point rating scale ranging from 1 (not at all) to 5 (extremely serious). $^{*}p < .05$. $^{**}p < .01$.

randomization effect. The results show that the B-CBT participants were significantly younger than SHP participants at $p = 0.04$. At 1 week after the MVC, the IES-R Hyperarousal score of the B-CBT participants was higher than that of SHP participants at $p = .006$. At 1 month after the MVC, the participants assigned to the B-CBT condition had a higher IES-R score for Hyperarousal at $p = .001$, a higher HADS-A score at $p = .007$, and a higher HADS-D score at $p = .012$. No significant difference was found for any of the other variables.

Fifteen percent of the participants (8 out of 53) did not reply to posttreatment follow-up monitoring at 3 months and 6 months after the MVC. The non-reply rates for the two treatment conditions were statistically comparable, with 5 of the 25 participants (20%) in the B-CBT and

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3 of the 28 participants (11%) in the SHP, $p > .05$. Analysis of the demographic characteristics and pretreatment psychopathology measures that compared repliers and non-repliers revealed that the Avoidance subscale score at 1 month after the MVC for B-CBT non-repliers ($n = 5$, $x = 2.30$, $SD = 0.56$) was higher than that of repliers ($n = 20$, $x = 1.54$, $SD = 0.69$), $t = -2.27$, $p = 0.03$). Repliers and non-repliers in the B-CBT and SHP conditions, respectively, did not differ in any of the other pretreatment variables.

Effects of the treatment

Differences in symptoms. The analyses of covariance revealed significant effect of treatment in the HADS-A and HADS-D subscale scores, with the B-CBT participants reporting greater improvement than the SHP participants at 6-month follow-up. The difference in the HADS subscales scores between the two conditions at 3-month follow-up and the IES-R subscale scores at 3-month and 6-month follow-up were not significant (Table 2). The results of the repeated measures ANOVAs in the mixed design analysis were similar. Significant interactions between Group x Time were identified for HADS-A $F(2,66) = 3.87$, $p < .05$, $\eta\rho^2 = .11$, and HADS-D $F(2,66) = 4.43$, $p < .05$, $\eta\rho^2 = .12$. A planned within-subject contrast that compared baseline and post-intervention measures found that anxiety was more reduced in the B-CBT condition than in the SHP condition from baseline to 3-month, $F(1, 33) = 5.31$, $p < .05$, $\eta\rho^2 = .14$, and 6-month follow-up, $F(1,33) = 5.54$, $p < .05$, $\eta\rho^2 = .14$, respectively. The planned within-subject contrast for HADS-D found that the reduction in depression in the B-CBT condition was more than that in the SHP condition from baseline to 6-month follow-up, $F(1,33) = 7.36$, $p = .01$, $\eta\rho^2 = .18$. The treatment effects for both conditions were also examined by comparing their effect sizes (Hedges' g) for the HADS and IES-R subscale scores. In general, the effect sizes for B-CBT were medium-to-large and those for SHP were small-to-medium for various measures. The effect sizes of B-CBT versus SHP for HADS-A at 3-month follow-up, and HADS-A and HADS-D at 6-month follow-up favoured B-CBT (Table 3). The pre and posttreatment means on HADS subscales are presented in Figure 2.

Treatment responders. The results of the dichotomous measures of treatment response are presented in Table 4. Positive treatment responders were defined by a reduction in HADS and IES-R subscale scores from equal or above the cut-off for moderate level of distress at 1 month pretreatment to below the cut-off at 6-month posttreatment follow-up. This result suggests that significantly more participants in the B-CBT than in the SHP condition had a positive treatment response for HADS-D and IES-R Hyperarousal (IES-R-H) from 1 month pretreatment to the 6-month posttreatment follow-up. In other words, a higher proportion of participants in the SHP condition passed the cut-off for moderate level of distress for depression and hyperarousal at 1 month pretreatment and remained the same at the 6-month posttreatment follow-up.

Logistic regression analyses

For the SHP condition, the pretreatment HADS total score at 1 month after the MVC qualified for the analysis of predicting treatment response at 6-month follow-up, which was defined by a reduction in the total IES-R score (Table 5). There was a good model fit (discrimination among groups) based on the HADS alone, $\chi^2(5, n = 25) = 2.45$, $p = .79$. Comparison of the log-likelihood ratios for models with and without HADS showed a reliable improvement

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Table 2. Results of analyses of covariance for main outcome measures (with 1-month pretreatment data as the baseline)

Measure	B-CBT Mean (*SD*)	SHB Mean (*SD*)	Adjusted mean difference (95% CI)	*F*	*p*	Hedges' g effect size (95% CI)
HADS-Anxiety, *M* (*SD*)						
Score at 3 months	8.24 (3.92)	10.05 (4.94)	−2.85 (−5.77 to 0.07)	(1,34) = 3.94	0.06	0.40 (−0.15 to 0.94)
Score at 6 months	7.79 (5.49)	9.63 (4.56)	−3.40 (−6.13 to −0.67)	(1,40) = 6.32	0.02*	0.36 (−0.90 to −0.18)
HADS-Depression, *M* (*SD*)						
Score at 3 months	8.47 (4.64)	8.30 (4.04)	−1.21 (−3.92 to 1.51)	(1,34) = 0.82	0.37	0.04 (−0.50 to 0.58)
Score at 6 months	6.84 (5.34)	8.71 (4.43)	−3.56 (−6.24 to −0.87)	(1,40) = 7.16	0.01*	0.38 (−0.92 to 0.17)
IES-R (Intrusion)						
Score at 3 month	1.32 (0.79)	1.64 (0.70)	−0.37 (−0.87 to 0.12)	(1,34) = 2.33	0.14	0.42 (−.97 to 0.12)
Score at 6 months	1.13 (0.89)	1.53 (0.76)	−0.41 (−0.93 to 0.10)	(1,40) = 2.65	0.11	0.48 (−1.03 to 0.07)
IES-R (Avoidance), *M* (*SD*)						
Score at 3 months	1.12 (0.81)	1.63 (0.64)	−0.47 (−0.97 to 0.02)	(1,34) = 3.80	0.06	0.69 (−1.25 to −0.14)
Score at 6 months	1.11 (0.88)	1.36 (0.64)	−0.22 (−0.69 to 0.26)	(1,40) = 0.84	0.37	0.32 (−0.87 to 0.22)
IES-R (Hyperarousal), *M* (*SD*)						
Score at 3 months	1.56 (0.90)	1.68 (0.84)	−0.35 (−0.95 to 0.26)	(1,34) = 1.33	0.26	0.14 (−0.68 to 0.40)
Score at 6 months	1.39 (1.00)	1.56 (0.98)	−0.40 (−1.04 to 0.23)	(1,40) = 1.65	0.21	0.17 (−0.71 to 0.37)

Notes: HADS = Hospital Anxiety and Depression Scale; IES-R = Impact of Event Scale – Revised. $^{*}p < .05$.

Table 3. Results of repeated measures analyses of variance for main outcome measures (with 1-month pretreatment data as the baseline)

Measure	*F*	*p*	Hedges' g effect size (95% CI)	*F*	*p*	*Hedges' g effect size* (95% CI)	*p* Difference between two Hedge's g
Symptom reduction at 3-month posttreatment after MVC							
		C-CBT ($n = 17$)				SHP ($n = 20$)	
HADS-Anxiety	16.29	0.001***	1.27 (0.67 to 1.88)	1.80	0.195	0.28 (−0.25 to 0.81)	0.004**
HADS-Depression	9.53	0.007**	0.80 (0.22 to 1.38)	1.89	0.186	0.30 (−0.22 to 0.83)	0.110
IES-R (Intrusion)	14.91	0.001***	1.17 (0.57 to 1.77)	9.21	0.007**	0.79 (0.25 to 1.33)	0.174
IES-R (Avoidance)	6.20	0.024*	0.71 (0.14 to 1.28)	1.34	0.261	0.39 (−0.14 to 0.92)	0.196
IES-R (Hyperarousal)	16.53	0.001***	1.27 (0.66 to 1.87)	7.00	0.016*	0.63 (0.09 to 1.16)	0.067
Symptom reduction at 6-month posttreatment after MVC							
		C-CBT ($n = 19$)				SHP ($n = 24$)	
HADS-Anxiety	21.89	0.000***	1.15 (0.55 to 1.75)	6.25	0.020*	0.46 (−0.08 to 0.99)	0.044*
HADS-Depression	15.97	0.001***	1.02 (0.43 to 1.61)	0.51	0.483	0.12 (−0.40 to 0.65)	0.013*
IES-R (Intrusion)	16.00	0.001***	1.30 (0.69 to 1.91)	12.34	0.002**	0.24 (−0.29 to 0.76)	0.203
IES-R (Avoidance)	3.01	0.100	0.51 (−0.05 to 1.07)	5.55	0.027*	0.32 (−0.20 to 0.85)	0.362
IES-R (Hyperarousal)	19.89	0.000***	1.35 (0.74 to 1.97)	11.38	0.003**	0.75 (0.21 to 1.29)	0.070

Notes: HADS = Hospital Anxiety and Depression Scale; IES-R = Impact of Event Scale-Revised. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

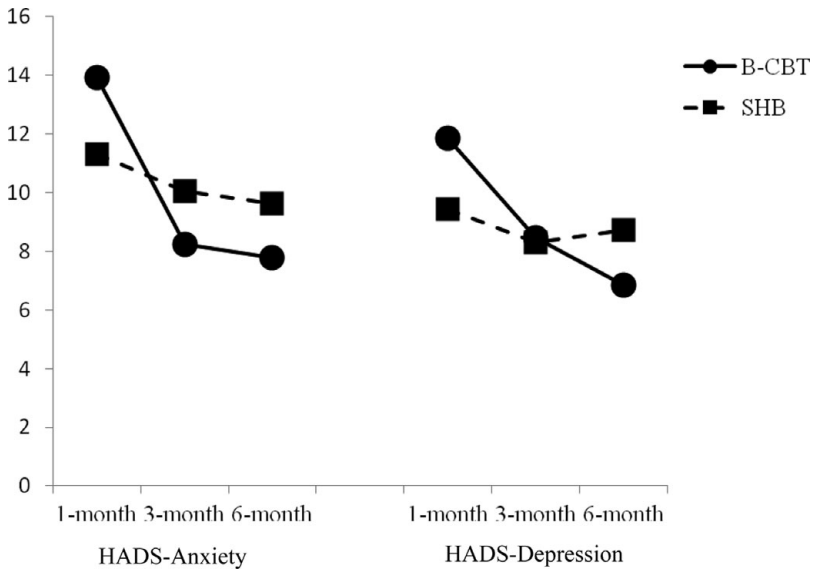

Figure 2. Change of HADS subscale scores from 1-month to 6-month. B-CBT = Brief Cognitive Behavioral Therapy. SHP = Self-help Program

Table 4. Dichotomous measures of treatment response defined by subscale scores reduction from equal/above cut-off [1] at 1-month pretreatment to below cut-off at 6-month posttreatment

Measure	B-CBT[2] $n = 20$	SHP[2] $n = 25$	χ^2 Test ($df = 1$)	p	Effect sizes *Phi*
HADS-Anxiety	40 (8)	24 (6)	1.63	0.20	−0.19
HADS-Depression	45 (9)	16 (4)	4.74	0.03*	−0.40
IES-R (Intrusion)	30 (6)	36 (9)	0.09	0.76	0.09
IES-R (Avoidance)	30 (6)	20 (5)	0.77	0.38	−0.13
IES-R (Hyperarousal)	65 (13)	28 (7)	7.11	0.007**	−0.40

Notes: HADS = Hospital Anxiety and Depression Scale Anxiety subscale; IES-R = Impact of Event Scale-Revised. [1]Cut-off for HADS subscale scores = 10; IES-R subscale scores = 2, both indicating moderate level of distress. [2]Percentage of participants who had improved as indicated by reduction of subscale score in HADS or IES-R from equal/above to below cut-off, with actual number of participants in brackets. $p < .05$; ** $p < .01$

in predictive power with the addition of HADS, $\chi^2(1, n = 25) = 5.49$, $p < .05$. Based on the regression model with no specific predictor entered, the overall correct prediction rate was 64%. With the addition of the HADS total score at 1 month after MVC as a predictor, the overall correct prediction rate improved to 72%, with an 88% success rate for a positive treatment response and a 44% rate for a negative treatment response. A post hoc test found that the SHP participants with a positive treatment response had a lower pretreatment HADS total score ($M = 18.75$, $SD = 4.49$) than the participants with a negative treatment response ($M = 23.78$, $SD = 5.49$), $F(1,24) = 6.15$, $p = 0.02$, $g = 0.92$.

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Table 5. Results of stepwise linear regression analysis using the reduction of Impact of Event Scale-Revised (IES-R) total score from 1-month to 6-month posttreatment as the dependent variables for the self-help program group

Variable	Regression coefficient (β)	Standard error of β	Wald	p	Exp(b) (95% CI)
Predicting the reduction of IES-R total score at 6-month posttreatment follow-up					
HADS	0.21	0.10	4.03	0.04	1.23 (1.00 to 1.51)
(Constant)	−4.92	2.21	4.95	0.03	.01

None of the other results of the logistic regression for predicting the treatment response at 6 months, defined as a reduction in total HADS score for the SHP condition and in the HADS or IES-R total score for the B-CBT condition, were significant. None of the independent variables qualified for the analysis of predicting the treatment response at 6-month follow-up.

Discussion

This study replicated previous findings on the effect of B-CBT in hastening recovery from posttraumatic stress in a Chinese culture. As in the previous study of Bisson and colleagues (2004), after the adjustment of the pretreatment symptom level, the psychological distress, in terms of anxiety and depression decreased significantly more in the B-CBT group than in the SHP group. To extend the previous findings, dichotomous measures and logistic regression were used to study the proportion of participants who benefited from the treatment and to identify the predictors of treatment efficacy. The findings showed that a higher proportion of participants who received B-CBT than those who received the unguided self-help program reported a reduction in symptoms from the cut-off for a moderate level of distress for depression and hyperarousal to below the cut-off when examined at 6-month follow-up. Linear regression analyses found that a higher pretreatment HADS total score was predictive of a worse outcome at 6-month follow-up for the SHP condition.

Design

A careful study design and the comparison of two kinds of brief interventions for psychological symptoms after a traumatic event were the key objectives of this study. As in many previous studies on the treatment effect of CBT, more resources were invested in the CBT than in the other kind of early intervention. However, the CBT used in this study was relatively brief compared with other studies, which involved over 10 weekly sessions of CBT (Ehlers et al., 2003). The specific sample of MVC survivors recruited from an A&E facilitated the investigation of the effect of a brief intervention on MVC survivors who had physical injury and a direct experience of the crash. The 3-month and 6-month follow-up periods enabled both an immediate and longer-term assessment of the intervention. The use of dichotomous criteria for treatment response allowed the occurrence and predictors of beneficial or harmful outcomes associated with the different early interventions to be identified. As previous studies have found, symptoms of mood disorder and PTSD may spontaneously reduce over 6 months (e.g. Ehlers et al., 2003), in which case an intervention might be considered to have a harmful effect if a significant portion of the participants

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experienced no change or a worsening of symptoms after the intervention. The inclusion criteria adopted were likely to result in the inclusion of individuals more likely to respond to a short-term and focused intervention.

This study design is not directly comparable with that of previous studies that included participants identified as having a clinical diagnosis of PTSD and applied the intervention within 4 weeks of the traumatic experience (e.g. Foa et al., 2006). Instead, the sample characteristics and the intervention period are more comparable to those of the study of Bisson et al. (2004), in which participants had to be experiencing symptoms but no diagnosis was required and the intervention was between 5 and 10 weeks post-trauma.

Efficacy

In common with previous positive-outcome RCTs (Bisson et al., 2004; Foa et al., 2006), the present results suggest that a 4-session B-CBT program may reduce symptoms related to posttraumatic stress following an MVC and was tolerated by most of the participants. One possible factor contributing to the positive outcome of B-CBT in this study, which is contrary to previous negative results for the effect of early single-session interventions (Adler et al., 2008; Rose et al., 2002), is the regular controlled exposure in multiple sessions rather than a single session. The educational component and cognitive restructuring also probably enhanced the processing of the traumatic experience and tolerance of the prolonged exposure exercise among the participants.

The comparison of effect sizes favoured B-CBT over SHP after the pretreatment symptom level has been controlled for analysis. Possible mechanisms for the negative outcome of SHPs have been previously discussed (Ehlers et al., 2003). These include the unclear definition and unguided procedure of exposure. In B-CBT, the therapist can carefully define and apply treatment procedures so that the participants will attain an optimal level of exposure. Although the SHP used in the study was based on a CBT approach, the participants were left to themselves to process the information and carry out the exposure exercise. A further sense of helplessness and failure may have occurred if participants failed to improve and continued to suffer from their symptoms despite reading and following the instructions in the SHP when they had made an effort to do so. The results reveal that a high pretreatment symptom level predicted a negative outcome for the SHP condition. Thus, offering SHP for the prevention or treatment of psychological distress for MVC survivors at risk of developing a chronic condition is not supported.

In future studies with a larger sample it would be worthwhile to explore the factors that contribute to drop-out and the effect of different treatment components. In this study, non-repliers in the B-CBT condition had a higher IES-R Avoidance score than those who replied. For these individuals, rapport building, psychoeducation, and cognitive restructuring may be required to improve their processing of the traumatic experience and their tolerance of the prolonged exposure exercise. Cognitive processing without the written exposure component may also help to enhance treatment compliance and efficacy (Resick et al., 2008). The finding that a high pretreatment symptom level predicted a negative outcome in the SHP condition suggests that caution must be exercised in using an SHP for individuals after trauma without prior screening.

The positive impact of B-CBT was not very large in this study, as the intervention was limited to four sessions. However, the results show that the positive impact associated with

B-CBT was higher than that associated with the SHP, with a significant difference more likely to be identified at the 6-month than at the 3-month follow-up. This is consistent with previous studies that failed to identify a significant treatment effect for B-CBT on outcome at 3-month follow-up, as the treatment had only recently been completed and ongoing confrontation of the feared stimuli is considered essential for the positive effect of the exposure work to be significant (Ehlers et al., 2003).

In contrast with the study of Bisson et al. (2004), which found significant differences in PTSD symptoms but no significant differences in anxiety and depression scores between the intervention and control groups, this study found significant differences in anxiety and depression scores between the B-CBT and SHP conditions at 6-month follow-up, but no difference in the PTSD symptoms measured by IES-R. This raises questions about the significance of the treatment effect on specific PTSD symptoms. The result may reflect the difference in severity of psychological distress experienced by the participants in the two studies. The present findings support the relevance of using different measures for tapping symptoms with a high prevalence of co-morbidity (i.e. anxiety, depression, and posttraumatic stress symptoms).

Limitations

The limitations of the study include a small sample size, which limited the power of analysis. Further, although the assignment of the intervention condition was randomized, the B-CBT participants had a significantly higher level of hyperarousal, anxiety and depression symptoms than the SHP participants at baseline. The pretreatment symptom level was adjusted in the main analysis, but the power of the analysis to identify a significant treatment effect for SHP in the analysis of dichotomous measures may have been limited because the baseline scores of the SHP participants were lower in the first place. As there was not a no-treatment control group, the harmful effect of SHP and the positive outcome of B-CBT compared with no intervention at all could not be definitively concluded.

Suboptimal treatment also limits the generalizability of this study, which is a replication of Bisson's (2004) work. A client's compliance with the use of exposure in the form of image habituation training (IHT) for treating posttraumatic stress was found to be low in a previous study (e.g. only 1 of 14 patients complied with the IHT) (Scott and Stradling, 1997). The main exposure components of the B-CBT used here were writing, reading, and an in vivo exposure exercise but not IHT, and the compliance rate of the exposure was not evaluated. Hence, the B-CBT offered may have been sub-optimal. The comparison with the SHP can also be viewed as sub-optimal, as guidance for clients on their exposure treatment was not included. The results presented here thus cannot be generalized to guided self-help intervention in which the therapist helps clients with their exposure treatment. In addition, the two interventions studied cannot be considered comparable in terms of resource utilization, homework compliance, and intensity of participation, which could have contributed to the more favourable outcome of B-CBT compared with the unguided SHP.

The analysis for treatment effect, which relied on identification of treatment responders by examining the proportion of participants moving from above to below a cut-off, is not an ideal analysis approach as an individual can move from 1 point below a cut-off due to unreliability of measure, instead of systematic change. In future study with a larger sample, the reliability of change analysis or a more stringent definition of positive/negative treatment responders

(e.g. a significant change of symptom level from the cut-off) may be used to examine if symptom level change is due to measurement reliability or other factors (e.g. intervention effect).

Due to limited resources, diagnostic interviews (e.g. CAPS) were not used, and a diagnosis of PTSD or mental disorder was not required for inclusion in the study. Further, the severity of injury was mild for most of the participants. Thus, the generalization of the present findings to individuals with a diagnosable mental disorder or more severe injury may not be appropriate. This limits the study in terms of examining the effect of the treatment on diagnostic change. As found in a meta-analysis of multiple-session early interventions following traumatic events, trauma-focused CBT within 3 months of a traumatic event may be effective for individuals with traumatic symptoms, especially those who meet the threshold for a clinical diagnosis. As the presence of a specific diagnosis may be the most important predictor of who would benefit from trauma-focused CBT (Roberts, Kitchiner, Kenardy and Bisson, 2009), the efficacy of B-CBT for sub-clinical traumatic stress identified in this study must be interpreted with caution.

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